The documentation and process conversion measures necessary to comply with this revision shall be completed by 25 October 1999

INCH POUND

MIL-PRF-19500/544B
25 July 1999
SUPERSEDING
MIL-S-19500/544A(USAF)
21 January 1994

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER
TYPES 2N5152, 2N5154, 2N5152L, 2N5154L, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for NPN, silicon, power transistors for use in high-speed power-switching applications. Four levels of product assurance are provided for each encapsulated device type and two levels of product assurance are provided for each unencapsulated device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. Figure 1 (T0-5, T0-39) and figures 2 and 3 (die dimensions).

1.3 Maximum ratings.

P_T 1/ T_A = +25°C	P_T 2/ T_C = +25°C	V_{CBO}	V_{CEO}	V_{EBO}	I_C	I_C 3/	Reverse pulse 4/ energy	Safe operating area	T_{stg} and T_J
W	W	V dc	V dc	V dc	A dc	A dc	mJ	See figure 4	°C
1	11.8	100	80	5.5	2	10	15		-65 to + 200

1/ Derate linearly 5.7 mW/°C for T_A > +25°C
2/ Derate linearly 66.7 mW/°C for T_C > +25°C
3/ This value applies for Pw ≤ 8.3 ms, duty cycle ≤ 1%
4/ This rating is based on the capability of the transistors to operate safely in the unclamped inductive load energy test circuit of figure 5.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAC, 3990 East Broad Street, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5961

1.4 Primary electrical characteristics at T_C = +25°C.

Limits	h_{FE2} 1/ V_{CE} = 5 V I_C = 2.5 A		$\lvert h_{fe} \rvert$ V_{CE} = 5 V I_C = 500 mA dc		$V_{BE(sat)2}$ 1/ I_C = 5 A dc I_B = 500 mA dc	$V_{CE(sat)2}$ 1/ I_C = 5 A dc I_B = 500 mA dc	C_{obo} V_{CB} = 10 V dc I_E = 0 f = 1 Mhz	$R_{\theta JA}$	$R_{\theta JC}$
	2N5152 2N5152L	2N5154 2N5154L	2N5152 2N5152L	2N5154 2N5154L					
					Vdc	Vdc	pF	°C/W	°C/W
Min	30	70	6	7					
Max	90	200			2.2	1.5	250	175	15

1/ Pulsed (see 4.5.1)

2. APPLICABLE DOCUMENTS

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in section 3 and 4 of this specification, whether or not they are listed.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Automated Printing Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

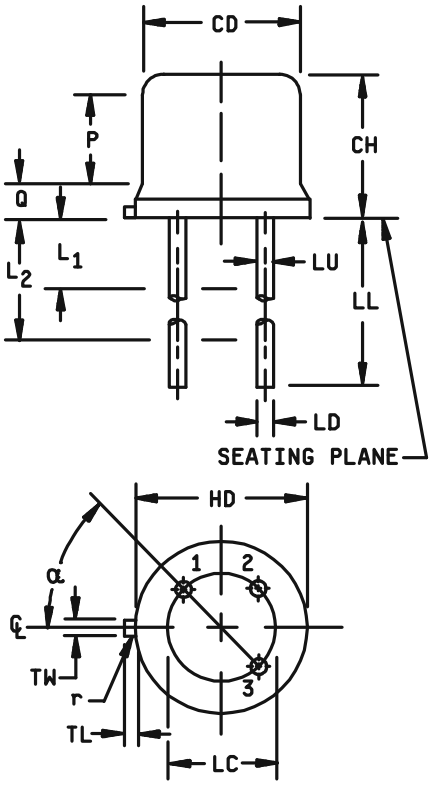
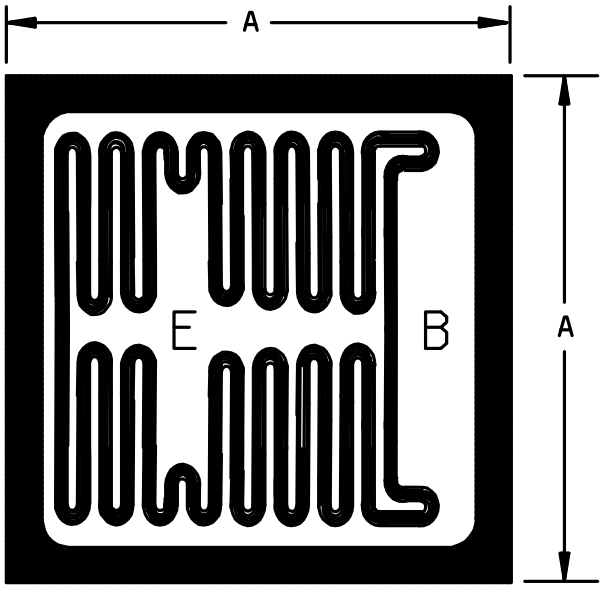


FIGURE 1. Physical dimensions (similar to TO - 5, TO-39).

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	0.305	0.335	7.75	8.51	
CH	0.240	0.260	6.10	6.60	
HD	0.335	0.370	8.51	9.40	
LC	0.200 TP		5.08 TP		6
LD	0.016	0.021	0.41	0.53	7, 8
LL	0.500	0.750	12.70	19.05	7, 8, 12
LU	0.016	0.019	0.041	0.48	7, 8
L_1	---	0.050	---	1.27	7, 8
L_2	0.250	---	6.35	---	7, 8
Q	---	0.050	---	1.27	5
TL	0.029	0.045	0.74	1.14	4
TW	0.028	0.034	0.71	0.86	3
r	---	0.010	---	0.25	10
α	45° TP		45° TP		6
P	0.100		2.54		

NOTES:
1. Dimension are in inches.
2. Metric equivalents are given for general information only.
3. Beyond r (radius) maximum, TH shall be held for a minimum length of 0.011 (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. Leads at gauge plane 0.054 +0.001 -0.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within 0.007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. The device may be measured by direct methods.
7. Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and L minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. In accordance with ANSI Y14.5M, diameters are equivalent to ∅x symbology.
12. For "L" suffix devices, dimension LL is 1.50 (38.10 mm) minimum, 1.75 (19.05 mm) maximum.

FIGURE 1. Physical dimensions (similar to TO - 5, TO-39) continued.

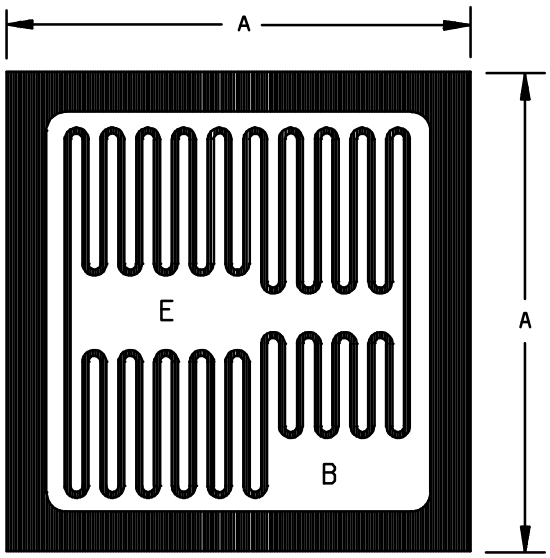


Dimensions				
LTR	Inches		Millimeters	
	Min	Max	Min	Max
A	0.117	0.127	2.97	3.23

NOTES:
1. Dimensions are in inches.
2. Metric equivalents (millimeters) are in parenthesis.
3. Metric equivalents are given for general information only.
4. Unless otherwise specified, tolerance is ± 0.005 (0.13 mm).
5. The physical characteristics of the die are;
   Thickness: 0.008 (0.20 mm) to 0.012 (0.30 mm), tolerance is ± 0.005 (0.13 mm).
   Top metal: Aluminum, 40,000 Å minimum, 50,000 Å nominal.
   Back metal: Gold 2,500 Å minimum, 3,000 Å nominal.
   Back side: Collector.
   Bonding pad: B = 0.015 (0.38 mm) x 0.0072 (0.183).
   E = 0.015 (0.38 mm) x 0.0060 (0.152).

Inches	mm
0.005	0.13
0.006	0.15
0.0072	0.183
0.008	0.20
0.012	0.30
0.015	0.38
0.117	2.97
0.127	3.23

FIGURE 2. JANHCA and JANKCA die dimensions.



Dimensions				
LTR	Inches		Millimeters	
	Min	Max	Min	Max
A	0.095	0.105	2.41	2.66

NOTES:
1. Dimensions are in inches.
2. Metric equivalents (millimeters) are in parenthesis.
3. Metric equivalents are given for general information only.
4. Unless otherwise specified, tolerance is ± 0.005 (0.13 mm).
5. The physical characteristics of the die are;
   - Thickness: 0.0078 (0.198 mm) nominal, tolerance is ± 0.005 (0.13 mm).
   - Top metal: Aluminum, 25,000 Å minimum, 33,000 Å nominal.
   - Back metal: Gold 1,500 Å minimum, 2,500 Å nominal.
     - Back side: Collector.
     - Bonding pad: 0.012 (0.305 mm) min. x .030 (0.761 mm) min.

Inches	mm
0.005	0.13
0.0078	0.198
0.012	0.30
0.030	0.76
0.095	2.41
0.105	2.66

FIGURE 3. JANHCB and JANKCB die dimensions.

3. REQUIREMENTS

3.1 Associated specification. The individual item requirements shall be in accordance with MIL-PRF-19500 and as specified herein.

3.2 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.3 Interface requirements and physical dimensions. The Interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and figure 1 (T0-5, T0-39), and figures 2 and 3 (die dimensions) for JANHC and JANKC herein.

3.3.1 Current density. Current density of internal conductors shall be as specified in MIL-PRF-19500.

3.3.2 Lead finish. Lead finish shall be solderable as defined in MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.6 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I herein.

3.7 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified manufacturer's list before contract award (see 4.2 and 6.3).

4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Screening (see 4.3).

c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and herein.

4.2.1 JANHC and JANKC qualification. JANHC and JANKC qualification inspection shall be in accordance with MIL-PRF-19500.

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with table IV of MIL-PRF-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JANS levels	JANTX and JANTXV levels
3c	Thermal response (see 4.5.3)	Thermal response (see 4.5.3)
9	I_{CES1} and h_{FE2}	Not applicable
11	I_{CES1} and h_{FE2}; ΔI_{CES1} = 100 percent of initial value or100 nA dc, whichever is greater. Δh_{FE2} = ± 20 percent.	I_{CES1} and h_{FE2}
12	See 4.3.2	See 4.3.2
13	Subgroup 2 and 3 of table I herein; ΔI_{CES1} = 100 percent of initial value or 100 nA dc, whichever is greater. Δh_{FE2} = ± 20 percent.	Subgroup 2 of table I herein; ΔI_{CES1} = 100 percent of initial value or100 nA dc, whichever is greater. Δh_{FE2} = ± 20 percent.

4.3.1 Screening (JANC). Screening of JANC die shall be in accordance with MIL-PRF-19500. As a minimum, die shall be 100 percent probed to insure compliance with group A, subgroup 2.

4.3.2 Power burn-in conditions. Power burn-in conditions are as follows: T_A = Room ambient as defined in the general requirements of MIL-STD-750, 4.5.

V_{CE} = 10 percent of V_{CE} minimum (see 1.3).

NOTE: No heat sink or forced air cooling on the device shall be permitted.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and paragraphs 4.4.2.1 and 4.4.2.2 herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

4.4.2.1 Group B inspection table VIa (JANS) of MIL-PRF-19500.

Subgroup	Method	Conditions
B4	1037	V_{CB} = 10 percent of V_{CBO} (min) (see 1.3).
B5	1027	V_{CB} = 10 percent of V_{CBO} (min) (see 1.3); T_J = +275°C ± 5°C for 96 hours. Adjust as required by the chosen T_A to give an average lot T_J = +275°C. Marking legibility requirements shall not apply.
B6	3131	See 4.5.2.

4.4.2.2 Group B inspection, table VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Conditions
B3	1027	For eutectic die attach: V_{CB} = 10 percent of V_{CBO} (min) (see 1.3); $T_A \leq +35^\circ$ C (max); adjust P_T to achieve $T_J = +150^\circ$C (min).
B3	1037	For solder die attach: V_{CB} = 10 percent of V_{CBO} (min) (see 1.3) 2,000 cycles.
B5	3131	See 4.5.2.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF- and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

Subgroup	Method	Conditions
C2	2036	Test condition E.
C6	1026	For eutectic die attach: V_{CB} = 10 percent of V_{CBO} (min) (see 1.3); $T_A \leq +35^\circ$ C (max); adjust P_T to achieve $T_J = +150^\circ$C (min).
C6	1037	For solder die attach: V_{CB} = 10 percent of V_{CBO} (min) (see 1.3) 6,000 cycles.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table IX of MIL-PRF-19500 and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

Subgroup	Method	Condition	Sampling plan
E1	1051	500 cycles	45 devices, c = 0
E2	1039	Condition A: 500 hours	45 devices, c = 0
E3		Not applicable	
E4	3131	$R_{\theta JC}$ = 15°C/W maximum (See 4.5.2)	22 devices, c = 0
E5		Not applicable	

4.5 Methods of examination and test. Methods of examination and test shall be as specified in the appropriate tables and as follows:

4.5.1 Pulse measurements. Conditions for pulse measurements shall be as specified in Section 4 of MIL-STD-750.

4.5.2 Thermal resistance. Thermal resistance measurements shall be conducted in accordance with method 3131 of MIL-STD-750. The following details shall apply:

a. Collector current magnitude during power application shall be 500 mA dc.

b. Collector to emitter voltage magnitude shall be 10 V dc.

c. Reference temperature measuring point shall be the case.

d. Reference temperature measuring point shall be within the range +25°C ≤ T_R ≤ +35°C. The chosen reference temperature shall be recorded before the test is started.

e. Mounting arrangement shall be with heat sink to case.

f. Maximum limit of $R_{\theta JC}$ shall be 15.0°C/W.

4.5.3 Thermal response (ΔV_{BE} measurements). The ΔV_{BE} measurements shall be performed in accordance with MIL-STD-750, method 3131. The ΔV_{BE} conditions (I_H and V_H) and maximum limit shall be derived by each vendor. The chosen ΔV_{BE} measurement and conditions for each device in the qualification lot shall be submitted in the qualification report and a thermal response curve shall be plotted. The chosen ΔV_{BE} shall be considered final after the manufacturer has had the opportunity to test five consecutive lots. One-hundred percent safe operating area (SOA) testing may be performed in lieu of thermal response testing herein provided that the appropriate conditions of temperature, time, current, and voltage to achieve die attach integrity are approved by the qualifying activity. The following parameter measurements shall apply:

a. I_M measurement ..... 10 mA.

b. V_{CE} measurement voltage ..... 16 V (same as V_H).

c. I_H collector heating current ..... 1 A (minimum).

d. V_H collector-emitter heating voltage ..... 16 V (minimum).

e. t_H heating time ..... 10 ms.

f. t_{MD} measurement delay time ..... 50 µs (maximum)..

g. t_{SW} sample window time ..... 10 µs (maximum).

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical inspection	2071					
Subgroup 2						
Breakdown voltage, collector to emitter	3011	Bias condition D, I_C = 100 mA dc; I_B = 0, Pulsed (see 4.5.1)	$V_{(BR)CEO}$	80		V dc
Collector to emitter cutoff current	3041	Bias condition C, V_{CE} = 60 V dc; V_{BE} = 0	I_{CES1}		1.0	µA dc
Collector to emitter cutoff current	3041	Bias condition C, V_{CE} = 100 V dc; V_{BE} = 0	I_{CES2}		1.0	mA dc
Collector to emitter cutoff current	3041	Bias condition D, V_{CE} = 40 V dc, I_B = 0	I_{CEO}		50	µA dc
Emitter to base cutoff current	3061	Bias condition D, V_{EB} = 4 V dc, I_C = 0	I_{EBO1}		1.0	µA dc
Emitter to base cutoff current	3061	Bias condition D, V_{EB} = 5.5 V dc, I_C = 0	I_{EBO2}		1.0	mA dc
Forward current transfer ratio	3076	V_{CE} = 5 V dc, I_C = 50 mA dc	h_{FE1}			
2N5152, L 2N5154, L				20 50		
Forward current transfer ratio	3076	V_{CE} = 5 V dc, I_C = 2.5 A dc Pulsed (see 4.5.1)	h_{FE2}			
2N5152, L 2N5154, L				30 70	90 200	
Forward current transfer ratio	3076	V_{CE} = 5 V dc, I_C = 5 A dc Pulsed (see 4.5.1)	h_{FE3}			
2N5152, L 2N5154, L				20 40		

See footnote at end of table.

TABLE I Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 2 - Continued.						
Base-emitter voltage (nonsaturated)	3066	Test condition B, V_{CE} = 5 V dc, I_C = 2.5 A dc, Pulsed (see 4.5.1)	V_{BE}		1.45	V dc
Base-emitter saturation voltage	3066	Test condition A, I_C = 2.5 A dc, I_B = 250 mA dc, Pulsed (see 4.5.1)	$V_{BE(sat)1}$		1.45	V dc
Base-emitter saturation voltage	3066	Test condition A, I_C = 5 A dc, I_B = 500 mA dc, Pulsed (see 4.5.1)	$V_{BE(sat)2}$		2.2	V dc
Collector-emitter saturation voltage	3071	I_C = 2.5 A dc, I_B = 250 mA dc ,Pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.75	V dc
Collector-emitter saturation voltage	3071	I_C = 5 A dc ,I_B = 500 mA dc, Pulsed (see 4.5.1)	$V_{CE(sat)2}$		1.5	V dc
Subgroup 3						
High temperature operation:		T_C = +150°C				
Collector to emitter cutoff current	3041	Bias condition A, V_{CE} = 60 V dc, V_{BE} = -2 V dc	I_{CEX}		500	µA dc
Low temperature operation		T_C = -55°C				
Forward - current transfer ratio	3076	V_{CE} = 5 V dc, I_C = 2.5 A dc ,Pulsed (see 4.5.1)	h_{FE4}	15 25		
Subgroup 4						
Common-emitter, small-signal, short-circuit, forward-current transfer ratio	3206	V_{CE} = 5 V dc I_C = 100 mA dc, f = 1 kHz	h_{fe}			
2N5152, L 2N5154, L				20 50		

See footnote at end of table.

TABLE I Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - Continued.						
Magnitude of common-emitter, small-signal short-circuit, forward-current, transfer ratio	3306	V_{CE} = 5 V dc I_C = 500 mA dc, f = 10 MHz	$\lvert h_{fe} \rvert$			
2N5152, L				6		
2N5154, L				7		
Open-circuit output capacitance	3236	V_{CB} = 10 V dc, I_E = 0, f = 1 MHz	C_{obo}		250	pf
Switching time		I_C = 5 A dc, I_{B1} = 500 mA dc	t_{on}		0.5	µs
		I_{B2} = -500 mA dc	t_s		1.4	µs
		$V_{BE(off)}$ = 3.7 V dc	t_f		0.5	µs
		R_L = 6Ω;(See figure 6)	t_{off}		1.5	µs
Subgroup 5						
Safe operating area (d.c.)	3051	Pre-pulse condition for each test: V_{CE} = 0, I_C = 0, T_C = +25°C				
		Pulse condition for each test t_p = 1 sec. 1 cycle, T_C = +25°C, (See figure 4)				
Test # 1		V_{CE} = 5.8 V dc, I_C = 2 A dc				
Test # 2		V_{CE} = 32 V dc, I_C = 340 mA dc				
Test # 3		V_{CE} = 80 V dc, I_C = 20 mA dc				

See footnote at end of table.

TABLE I Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 5 - Continued.						
Safe operating area (unclamped inductive)		T_C = +25°C, R_{BB1} = 10Ω R_{BB2} = 100Ω, L = 0.3 mH, RL = 0.1Ω, V_{CC} = 10 V dc, V_{BB1} = 10 V dc, V_{BB2} = 4 V dc, I_{CM} = 10 A dc, (See figure 5)				
End-point electrical measurements		See table I, subgroup 2				
Subgroups 6 and 7						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500

TABLE II. Groups B, C and E delta electrical measurements. 1/ 2/ 3/

Steps	Inspection 4/	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward - current transfer ratio	3076	I_C = 2.5 A dc, V_{CE} = 5 V dc, Pulsed (see 4.5.1)	Δh_{FE2} 5/	± 20percent change from initial reading.		

1/ The delta electrical measurements for table VIa (JANS) of MIL-PRF-19500 are as follows:

a. Subgroups 4 and 5, see table II herein, step 1.

2/ The delta electrical measurements for table VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500 are as follows:

a. Subgroups 3 and 6, see table II herein, step 1.

3/ The delta electrical measurements for table VII of MIL-PRF-19500 are as follows:

a. Subgroups 6, see table II herein, step 1.

4/ See MIL-PRF-19500 for sampling plan.

5/ Devices which exceed the group A limits for this test shall not be accepted.

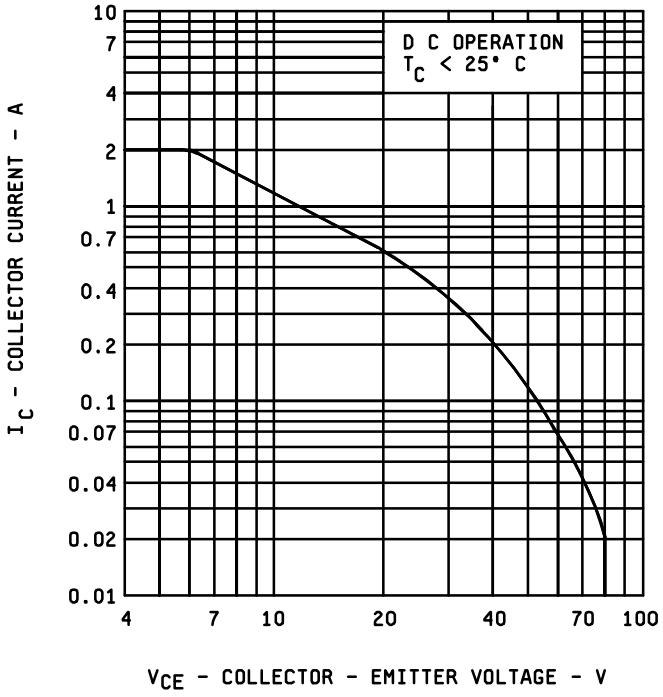


FIGURE 4. Maximum safe operating area.

R_{BB1} = 10Ω
R_{BB2} = 100Ω
L = 0.3 mH
R_L = 0.1Ω
V_{CC} = 10 V dc
I_{CM} = 10 A
V_{BB1} = 10 V dc
V_{BB2} = 4 V dc

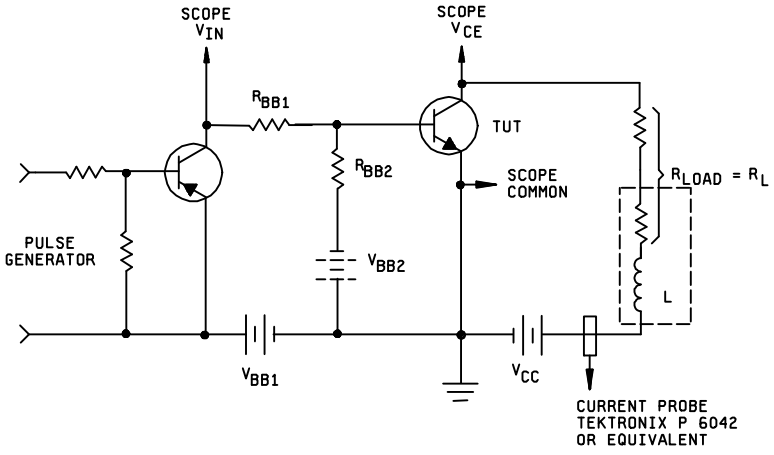
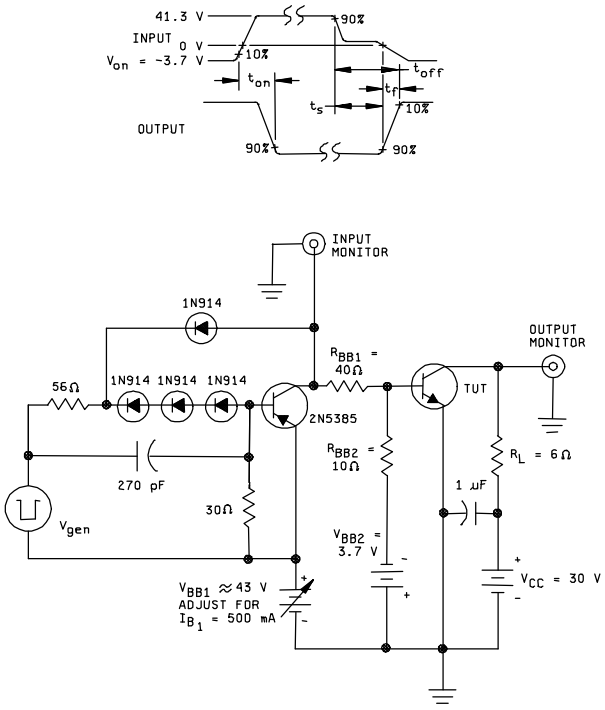


FIGURE 5. Unclamped inductive load energy test circuit.



NOTES:

1. V_{gen} is a -30 pulse (from 0 V) into a 50 ohm termination.
2. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15$ ns, $t_f \leq 15$ ns, $Z_{out} = 50$ ohm, duty cycle ≤ 2%, $t_w = 20$ µs.
3. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 1$ ns, $R_{in} \geq 10$ Mohm, $C_{in} \leq 11.5$ pF.
4. Resistors must be noninductive types.
5. The dc power supplies may require additional bypassing in order to minimize ringing.
6. An equivalant drive circuit may be used

FIGURE 6. Switching time test circuit.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Notes. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Issue of DODISS to be cited in the solicitation (see 2.1.1).

b. The lead finish as specified (see 3.3.2).

c. Type designation and quality assurance level.

d. Packaging requirements (see 5.1).

e. For die acquisition, the JANHC or JANKC letter version shall be specified (see figures 2 and 3).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturer's QML-19500 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, DSCC-VQE, Columbus, OH 43216.

6.4 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHCA2N5152) will be identified on the QML.

JANHC and JANKC ordering information		
PIN	Manufacturer	
	33178	34156
2N5152 2N5154	JANHCA2N5152 JANHCA2N5154	JANHCB2N5152 JANHCB2N5154
2N5152 2N5154	JANKCA2N5152 JANKCA2N5154	JANKCB2N5152 JANKCB2N5154

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Air Force - 11
DLA - CC

Review Activities:
Air Force – 19

Preparing Activity:
DLA - CC

(Project 5961-F155)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-PRF-19500/544B	**2. DOCUMENT DATE (YYMMDD)** 990725

3. DOCUMENT TITLE
SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER TYPES 2N5152, 2N5154, 2N5152L AND 2N5154L JAN, JANTX, JANTXV, JANS, JANHC AND JANKC

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) Commercial DSN FAX EMAIL	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. Point of contact: Alan Barone,	b. TELEPHONE Commercial 614-692-0510 DSN 850-0510 FAX 614-692-6939 EMAIL alan_barone@dscc.dla.mil
c. ADDRESS : Defense Supply Center Columbus, ATTN: DSCC-VAC, 3990 East Broad Street, Columbus, OH 43216-5000	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-68880